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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/014,949	10/26/2001	Makoto Yamamoto	44471-265522 (13700)	3657

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EXAMINER

RAO, SHRINIVAS H

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/014,949

Applicant(s)

YAMAMOTO ET AL.

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

Receipt is acknowledged of paper submitted under 35 U.S.C. 132 requesting a RCE from U.S. Serial No. 10. 014949 filed on October 26, 2001, which itself claims priority from Japanese Patent Application No. P2001-128187 filed on April 25, 2001 which papers have been placed of record in the file.

Request for Continued Examination

The request filed on 03/13/2003 for a Continued Prosecution Examination (RCE) under 37 CFR 1.114 based on parent Application No. 10/014,949 is acceptable and a RCE has been established. An action on the RCE follows.

Preliminary Amendment Status

Acknowledgment is made of entry of preliminary amendment filed 12 /30 /2002 has been entered on March 13, 2003.

Therefore claims 1,2,3,6,10 and 11 as amended by the amendment and claims 4-, 7-9,12 and 13 as previously recited are currently pending in the Application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergeron et al. (U.S. Patent No. 4,326,212, herein after Bergeron) previously applied and De La Moneda (U.S. Patent No. 4,149,906, herein after Moneda).

With respect to claim 1 Bergeron describes A lateral transistor including: a semiconductor substrate of the first conductivity type (Bergeron, fig. 1 D # 2, col. 4 line 32, vertical NPN with N base and Lateral NPON with P base substrate col. 3 line 57, col. 3 lines 4-5), a buried region of the second conductivity type disposed on said semiconductor substrate (Bergeron fig. 1d # 6, col. 3 lines 31-N-type).

Bergeron does not specifically mention or describe a uniform base region having a uniform doping profile.

However, Moneda, patent from the same filed of endeavor, describes in its abstract line 11, etc. a uniform base region having an uniform doping profile to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Moneda's a uniform base region having an uniform doping

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profile to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across in Bergeron's device to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across. (Moneda col. 3 lines 40-45).

The other elements of claim 1 are:

a plug region of second conductivity type disposed in said uniform base region, the plug region protrudes from a top surface of the uniform base region so as to reach to the buried region (Bergeron fig. 1 e # 32, col. 4 lines 43-N type), first and second main electrode regions of first conductivity type is disposed in and at the top surface of said uniform base region, the first and second main electrode regions being aligned in the lateral direction (See Bergeron fig. 1h # 54 in center of 40, Moneda fig. 8A), the graded base region having a doping profile such that impurity concentration decreases gradually along the lateral direction towards the second main electrode region from the first main electrode region. (Bergeron col. 5 lines 52-57, Moneda col. 1 lines 65-68), enclosing bottom and side of the first main electrode region, the graded base region has a doping profile such that the impurity concentration decreases towards the second main electrode region from the first main electrode region (Bergeron fig. 1j, col. 5 lines 25-35), wherein the combination of the uniform base region and the graded base region serve as a first base region of the lateral transistor (Bergeron fig. 1 j # 40 , col. 4 lines 58).

With respect to claims 2 and 3, wherein the second main electrode is frame, rectangular shaped and surrounds the graded region regions Bergeron figures 1a - 1 j

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54, 62 etc. as shown in are identical to those shown in figs. 2c-d, 3 m-p of the instant application and further surround graded base region 74).

With respect to claim 4, wherein the base contact region is disposed in and at a top of the plug region (fig. 1 h -j # 70 in and at a top of 36).

With respect to claim 5, a base wiring contacting with base contact region (It is inherent that the base contact region has to be in electrical contact with a base wiring in order to function as a base contact).

With respect to claim 6, wherein the semiconductor integrated circuit having lateral transistor includes ;

An integrated circuit (Bergeron fig. 1, col. 1 line 15 having a semiconductor substrate of the first conductivity type (Bergeron, fig. 1 D # 2, col 4 line 32 vertical NPN with N base substrate and lateral PNP with P base substrate col. 3 line 57,col. 3 lines 45) , a first buried region of the second conductivity type disposed on substrate .

Bergeron does not specifically mention or describe a uniform base region having an uniform doping profile the lateral doping profile being measured along a lateral direction parallel to the top surface of said semiconductor substrate.

However, Moneda, patent from the same filed of endeavor, describes in its abstract line 11, etc. a uniform base region having an uniform doping profile to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Moneda's a uniform base region having an uniform doping

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profile to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across in Bergeron's device to avoid forming local pockets of uneven capacitance to the flow of injected carriers there across. (Moneda col. 3 lines 40-45).

The remaining elements of claim 6 are :

a first plug region of second conductivity type disposed in said uniform base region, the plug region protrudes from a top surface of the uniform base region so as to reach to the buried region (Bergeron fig. 1 e # 32, col. 4 lines 43-N type), first and second main electrode regions of the first conductivity type disposed in and at the top surface of the uniform base region and aligned in the lateral direction . (Bergeron fig. 1 h # 54, 60, 62 col. 5 lines 17P type), a graded base region of the second conductivity type disposed in the uniform base region, enclosing bottom and side of the first main electrode region, the graded base region has a doping profile such that the impurity concentration decreases towards the second main electrode region from the first main electrode region (Bergeron fig. 1j, col. 5 lines 25-35), wherein the combination of the uniform base region and the graded base region serve as a first base region of the lateral transistor (Bergeron fig. 1 j # 40 , col. 4 lines 58).

With respect to claim 7, wherein the second buried region of the second conductivity type disposed on the semiconductor substrate and forming a part of the third main electrode region of the VFET (Fig. 1 h # 54 forming collector (electrode) of NPN transistor (Vertical transistor col. 5 line 13) , a drift region of second conductivity type disposed on the second buried region (Fig. 1 a j # 4, col. 4 line 32), a second base

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region of first conductivity type disposed in the drift region (fig. 1 a-j # 36 in region 4), a fourth main electrode region of second conductivity type disposed in the second base region (fig. 1 a-j # 70, col. 5 line 14).

With respect to claim 8, a second base wiring contacting with second base contact region (It is inherent that the base contact region has to be in electrical contact with a base wiring in order to function as a base contact).

With respect to claims 10 and 11, to the extent understood wherein the second main electrode is formed in a ring shape (Bergeron figures 1a - 1 j 54,70 etc. as shown in are identical to those shown in figs. 2c-d, 3 m-p of the instant application col.3 line 4, col.3 line 7 and further surround graded base region 74).

With respect to claim 12, wherein a first base contact region is disposed in and at the top surface of the plug region . (fig. 1 h j # 62 in and at a top of 36)

With respect to claim 13, wherein the first base wiring is in contact with the first base region. (It is inherent that the base contact region has to be in electrical contact with a base wiring in order to function as a base contact).

With respect to claim 9, wherein an element isolation region is disposed between the uniform base region and the drift region (Bergeron fig. 1 j # 42 between 36 and 4 and isolating them, col. 4 line 55)

Response to Arguments

Applicant's arguments filed July 22, 2002 have been fully considered but they are not persuasive for reasons set out below : .

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Applicant's arguments are based on impressive individual attacks on references whereas the rejection is based on combination of references.

Applicants' arguments that Moneda teaches doping profile only measured in vertical direction is not persuasive because Moneda in col. 3 lines 30-40 talks of both vertical and lateral NPN devices and in col. 8 lines 59-63, 64-67 etc. describes what is stated for vertical NPN device is also true for lateral devices.

Therefore the proposed combination of Bergeron and Moneda teaches all the presently recited limitations of claims 1- 13.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 7463926 for regular communications and (703) 872-9319 for After Final communications.

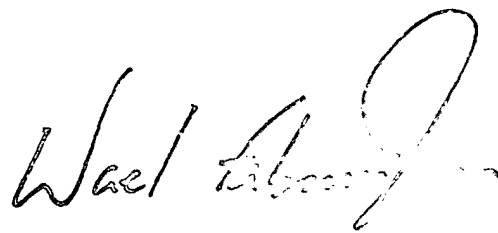
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 3067722.



Steven H. Rao

Patent Examiner

June 1, 2003



SUPERVISORY PRIMARY EXAMINER
TECHNOLOGY CENTER 1109